(NASA-TM-109790) THE CIVILIAN SPACE PROGRAM: ISSUES ROOTED IN HISTORY (NASA) 4 p

N94-71994

Unclas

Z9/12 0012437

NASA-TM-109790

P-4

THE CIVILIAN SPACE PROGRAM: ISSUES ROOTED IN HISTORY[1]

Much of the apparent intractability of the policy and institutional issues surrounding the U.S. space program and its principal agent, the National Aeronautics and Space Administration (NASA), is due to tensions deeply imbedded in the program's history. These tensions are traceable to the frequently incompatible demands placed on the agency by

1) the various institutional cultures that were brought together during the agency's first decade and

2) established American political strategies to assure responsiveness in democratic government.

Created in response to the Soviet challenge in space, NASA opened for business in 1958 with a complement of nearly eight thousand employees transferred from the National Advisory Committee for Aeronautics (NACA). By the end of 1960, NASA's personnel rolls nearly doubled with the addition of the Redstone Arsenal in Huntsville, Alabama (the ABMA, or Army Ballistic Missile Agency, later renamed the George C. Marshall Space Flight Center), the new Goddard Space Flight Center in Beltsville, Maryland, and the Jet Propulsion Laboratory of the California Institute of Technology, a contractor owned and operated facility. The Manned Spacecraft Center in Houston and the Kennedy Space Center at Cape Canaveral were added within the next 2 years.

A little over 80 percent of NASA's technical core during the 1960's and 1970's--its engineers and scientists--held within its corporate memory the experience of working with the NACA, the ABMA, and the organizations from which Goddard Space Flight Center had drawn much of its personnel, namely, the Naval Research Laboratory (NRL) and the Naval Ordnance Laboratory (NOL). Each group would bring its own institutional culture.

Established in 1915, the NACA for 43 years conducted research in aerodynamics, aircraft structures, and propulsion systems for both industrial and military clients. Its work in aeronautical engineering research was done largely by civil servants working in three aeronautical research laboratories in Virginia, California, and Ohio.[2] Culturally, the NACA could be distinguished by the ethos that permeated its laboratories--its emphasis on technical competence, evaluation of one's work by technical peers, and a collegial in-house research environment thought conducive to engineering innovation.

To the cultural core of the NACA was added, during NASA's first 2 years, the sympathetic NRL culture of in-house engineering research and science, and, by the ABMA group, the in-house technical development culture of the Army's arsenal system. The presence at the ABMA of a contingent of German rocket engineers reinforced its emphasis on in-house technical mastery and control. What these various cultural components shared was a common technical culture that placed technical judgment above political judgment, technical authority above negotiation or mediation. Technical (or scientific) cultures have shown themselves, historically, to be potentially unsympathetic to the unpredictable nature of democratic politics, often puzzled by democratic societies' ability to be more readily galvanized by ideology and changing opinion than by "scientific facts" or "technical expertise."

---

[1] This overview is based on two major studies conducted by the NASA History Division. Both entailed series of extensive interviews with both randomly and systematically selected NASA personnel, as well as demographic analyses and questionnaire surveys. One examines the evolution of NASA's organizational culture, and the other is an aggregate career biography of NASA's Apollo generation engineers. For further information, contact the NASA Office of Special Studies.

[2] Langley Aeronautical Laboratory at Hampton, Virginia (est. 1917); Ames Aeronautical Laboratory at Moffett Field, California (est. 1939); Flight Research Center at Muroc Dry Lake, California (est. 1946; Dryden Flight Research Center after 1976); and Lewis Flight Propulsion Laboratory in Cleveland, Ohio (est. 1940).

Sylvia Doughty Fries

Enclosure

The Cold War--most notably in the "Sputnik Crisis" and then in the Cuban Missile Crisis--stimulated not only the creation of NASA in 1958 but its tremendous expansion in the early 1960's to carry out the Apollo Program.[3] Though manifest militarily, the Cold War was an ideological and political war. As a result, NASA's most formative institutional experience embodied a tension between motive and means. An institutional culture that placed a premium on research, innovation, and technical judgment found itself having to adapt to political imperatives in a variety of important ways. The innovative risk-taking that was so fundamental to earlier missile or high-performance aeronautical research had to defer to redundancy and strict programmatic controls in the Apollo Program. U.S. Air Force program managers were brought into NASA, bringing with them a far greater reliance on private sector contractors than many of NASA's original core thought tolerable; soon nine out of every ten NASA dollars would be spent on contracted goods and services.

Reliance on private sector contractors, though not wholly new to NASA's predecessor organizations, was not simply a programmatic strategy favored by the U.S. Air Force. The practice had its roots deep in American history. Since the beginning of the republic, Americans have shared a widespread mistrust of large Government establishments. Coupled with this mistrust has been a public faith in private enterprise which, through the mechanism of a free market, was thought the best guarantor of economic security and a free society. On this usually bi-partisan ideological foundation, and partly in reaction to the alleged excesses of the New Deal, Federal policy (implemented by the Bureau of the Budget--after 1970, the Office of Management and Budget) encouraged Government agencies to acquire their goods and services from the private sector.

Virtually every aspect of NASA's business became subject to the gargantuan administrative appetite of Federal acquisitions policy. Meanwhile, the number of procurement actions processed by the agency quadrupled from roughly 44 thousand in 1960 to almost 190 thousand in 1963; by 1965, NASA was processing and monitoring almost 300 thousand contracts, or almost seven times the contracts the agency was managing only 5 years before. The dollar value of the average NASA contract more than doubled as well. However, during the same period NASA's civil service personnel increased by only 3.2 percent, and only a fraction of them were qualified to manage or monitor contractors. Thus, the burden of implementing the Government's "contract out" policy was borne increasingly by NASA's technical people. Engineers who had come to NASA (and earlier, the NACA) to do engineering found themselves increasingly cast in the role of overburdened contract monitors, ever more remote from the "hands-on" work that had attracted them in the first place.

The attempt to graft Air Force program management experience on the old NACA and its allied cultures introduced additional tensions. Originally an aggregate of fairly independent, in-house research organizations, NASA struggled with the centralized controls inherent in large-scale program management. Competition among the former laboratories, new NASA Centers, and Headquarters intensified. Because the Centers managed the contractors, and because the Centers housed NASA's technical expertise, they acquired the power of fiefdoms--and are often so called. Nonetheless, NASA sought to retain the discipline orientation of the NACA's decentralized laboratories--further accentuating a tension between aspirations of various research disciplines and program organization that would persist through much of NASA's institutional life.

The agency's inherited culture struggled against centralization at the Government-wide level as well. When the NACA was transformed in 1958 into NASA, the committee structure by which it had been administered was abandoned for an hierarchical and centralized management structure. Centralized Federal administrative controls that evolved during the 1940's and 1950's--controls like standardized

---

[3]Thanks to the GI Bill and its Korean War counterpart, the military services' reserve officers' training programs, cooperative work-education programs, and draft exemptions for those in engineering school or for those working for the Government in engineering fields, NASA and its contractors were able to mobilize unprecedented numbers of engineers and scientists. The agency's Civil Service personnel rolls increased by a factor of three, while the men and women employed on NASA contracts increased by a factor of 10. Likewise, NASA's annual budget increased an order of magnitude between 1960 and 1965, from roughly $500 million to $5.2 billion.

personnel management, budgeting, procurement, and operating procedures--were imposed on NASA by the Bureau of the Budget (later OMB), the Civil Service Commission (Office of Personnel Management, or OPM after 1979), and ultimately--of course--the U.S. Congress.

Of those centralized management controls, the Federal personnel system has proven as critical to NASA as Federal acquisitions policy. Its predecessor, the NACA, had struggled against Civil Service pay scales and hiring/promotion procedures and ceilings which, the NACA insisted, made it difficult to recruit and reward good engineers. NASA was able to obtain numerous "excepted" positions in order to hire the talent it needed to carry out the Apollo program. But these were indeed exceptions--exceptions to a long-term, systemic offensive by the Federal personnel system and philosophy against the agency's culture of technical competence. That system was and remains strongly biased toward seniority and generic functions; it assumes that increases in rank and salary should be directly related to increasing supervisory or managerial responsibilities. What these biases have meant for capable engineers in NASA (or throughout the Government) is that if they aspired to "get ahead," they would have to excel in functions not necessarily related to their technical skills, and that they would have to abandon engineering and go into management.

More than four-fifths of the NASA engineers recruited during NASA's first decade "advanced" into management positions, and among the older engineers who were employed with NASA or the NACA before 1960, over 90 percent are in management positions. There are cases when the "dual track" career ladder has worked, and an engineer has risen to the level of GS-16 without moving into management, but the widespread perception within the agency is that the dual-career ladder works only for the very exceptional few. Thus, for many NASA engineers, occupation has diverged increasingly from vocation as they began to spend more of their days doing work for which they had little natural inclination. Indeed, some NASA engineers, fearing obsolescence in engineering careers, consider management a legitimate and productive alternative for engineers who have accumulated some understanding of how technical programs work.

There is, however, a qualitative difference between "good" engineering and "good" management, and a system that rewards good engineering with a promotion into a management position risks promoting ill-equipped or temperamentally unsuited managers. A gift for engineering doesn't necessarily translate into the general outlook managers need to flex with unpredictable events and political uncertainties--persistent facts of life in Government organizations. Nor does absorption in a technical culture lend itself to the negotiating and mediating roles good managers must play in an era of participatory or consensual, rather than authoritarian, management.

The Apollo Program was unarguably an enormous achievement. But the transient motives behind the program, and the rapid mobilization of funds and personnel that made success possible, impeded the gradual evolution of a stable and broad public consensus about the Nation's purpose in space. Accordingly, when urban crisis and the divisive and inflationary effects of Vietnam altered public priorities, the vast institutional machinery created between 1958 and 1965 found itself with a diminishing political mandate. Unlike a massive military mobilization, however, after which enlistees expect to "return to civilian life," NASA *was* civilian life; it was careers; and no provision had been made for "demobilization." Survival required the agency's personnel to do what it, in fact, has done: to seek to restore its public mandate by identifying and serving constituencies.

The American political system was designed to limit the ability of any single group, however worthy its aspirations, to impose its vision on the rest of the country. Regular congressional and presidential elections, congressional oversight, the veto power, annual or bi-annual budget cycles, and centralized administrative controls were created to impose public accountability and political mediation on a pluralistic society. The system is designed to frustrate perfect and lasting solutions, a reflection of the Founders' rationalistic skepticism about doctrinaire views of the world. NASA has struggled within this system, which has failed to provide the kind of long-term public support the agency believes it needs. Aside from the constituencies provided by its contractors and the space science community, a "public mandate" *comparable to that which supported the agency in early 1960's* has been elusive.

The civilian space program is not, however, without a historic mandate that can be fulfilled within the terms of the political system upon which it depends. The willingness of the American people to support scientific research, geographic exploration, and the creation of national infrastructures has been proven again and again since the opening days of the Republic. This aggregation of public purposes, legitimated over time, may lack the glamour of some space enthusiasts' more visionary goals. But it has the virtue of providing a solid, if limited, and continuous base of political support for a viable civilian space program, as well as a rich variety of examples of how such a program might succeed.

* * *

Office of Special Studies
National Aeronautics and Space Administration
November 1990